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Tokens Matter

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Completed Research Paper

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Abstract

During the global pandemic, information workers were abruptly forced to engage in virtual work. This paper reports from an experiment seeking to formalize the formalization of small team coordination at London Blockchain Lab through the use of blockchain supported tokenization. The Web3 organizing vision promotes the technology as an enabler of new ways for individuals and organizations to engage in the transparent exchange of scarce digital rights. However, little attention has been paid to the use of blockchain technologies to coordinate distributed collaborative activities. This paper seeks to understand the viability of this vision amongst a community of expected early adopters through design experimentation resulting in interview data. The study points towards the significant gap between the Web3 vision and the problems of realizing this in practice. This highlights fundamental barriers to using blockchain for team collaboration while also pointing toward its potential. Even the most willing and able find it hard to turn code into law through tokenizing collaboration.

Introduction

When the global pandemic forced almost all organizations to implement virtual working, the global adoption of a wide range of collaborative technologies sought to support the coordination of distributed activities. One of the core aspects of this rapid transition was an increased need for a diversity of direct communication channels and structures to enable the orchestration of work. This paper considers the challenge of formalizing the coordination of small team distributed activities and, in particular, asks the question of how blockchain technologies can be adapted to specifically support such activities. Blockchain technology, or the Web3 organizing vision (Swanson & Ramiller, 1997), is believed to enable new forms of collaboration (Zavolokina et al, 2020; Vergne, 2020; Lumineau et al, 2021) — decentralization enabled by the blockchain is seen as a replacement for coordination in society leading to the emergence of a stateless global society (Atzori, 2015). The shift to the idea of "code is law" reinforced by blockchain through smart contracts to regulate human actions is widely welcomed by the crypto enthusiasts (Filippi & Hassan, 2016). The emergence of social tokens enables the crypto communities to function in a more automated and organized manner, supporting the tokenization of community reputation, individual services, and work allocation based on token rewards (Turley, 2020). However, blockchain is not a neutral technology and has prominent social and political implications (Filippi & Hassan, 2016). The technology relies critically on the persistent autarkic creation of interdependencies between tokens, computer networks, and social community (Rossi & Sørensen, 2019).

As research themes of blockchain technology, its governance, and its practical application are all nascent within the IS field (Notheisen et al, 2017), this paper explores the challenges of tokenizing distributed coordination within the London Blockchain Labs (LBL) community. The article explores the views of what degree of formalization is acceptable to improve collaboration within a small community of blockchain enthusiasts. Here, work that was already supported by a range of digital tools, was forced to become entirely virtual during the COVID-19 pandemic. This provided a unique opportunity to ask the question: *What are the challenges of tokenizing the coordination of distributed activities for a community that can be assumed highly susceptible to the effort?* While the literature has established the dangers of excessive automation of coordination (Schmidt, 2011, p.5), the emergence of blockchain and its ideology has led technological utopians to believe that formalization and automation are viable for wide-ranging coordinating activities (Atzori, 2015). This paper is founded on the assumption that blockchain enthusiasts will have positive expectations from blockchain-enabled systems, similar to the assumption that early adopters of social networking will more easily design systems utilizing this technology (Ghobadi & Mathiassen, 2020).

The process resulted in three designed artifacts and this paper focuses on the final iteration. The paper applies coordination theory to analyze the possible effects on the distributed coordination of team efforts within LBL. The study offers novel and paradoxical insights into the formalization of distributed team coordination necessitated by the global pandemic. While the LBL community recognized the need for the formalization of their team collaboration across projects, they at the same time resisted the proposals both of project management and of team efforts becoming more transparent and incentivized through tokenization of rewards. The paper shows that even for a community that enthusiastically embraces the Web3 organizing vision, the meeting of the simplicity of the vision with the harsh realities of complex socio-technical design arrangements is one fraught with challenges. Implementing the notion of "code is law" formalizing online community collaboration (Lindberg et al, 2016) in immutable blockchain-enabled systems raises a series of intractable issues. The paper, further, points toward some fundamental barriers to using blockchain for team collaboration while also highlighting the potential for such arrangements within and across organizations. As even the most ardent proponents of distributed coordination were forced to admit, distance does matter (Olson & Olson, 1991), so may those subscribing to the Web3 organizing vision also need to recognize that even the most willing find it hard to turn code into law.

Related Research

Coordination theory

Coordination is a process of managing the mutual interdependencies between activities (Malone & Crowston, 1994; Schmidt, 1993). Coordination Theory explains the role of formalized artifacts of various kinds, which can mediate the resolution of mutual interdependencies through mediating and simplifying distributed coordination (Schmidt, 2011). A varying degree of formalization can be applied in the mutual adaptation between participants coordinating their activities from highly unregulated informal conversations, over interactions regulated by organizational procedures, and formal artifacts stipulating the coordination of work to computational coordination mechanisms (Carstensen & Sørensen, 1996). Coordination mechanisms contain combinations of classification structures and protocols (Schmidt & Simone, 1996). The former provides the foundational structure stipulating the types of objects forming part of the coordination of activities, whereas the latter stipulates the unfolding of activities over time.

Practices around the usage of digital tools are usually affected by a mix of social factors, as noted in the research by Muralidhar et al. (2019) on financial inclusion through exploring peer-to-peer taxi-hailing service Ola. The social-technical gap in CSCW research claims that a technical solution does not solve a social problem, specifically, in the case of blockchain technology, it can only technically support trust but not socially (Lee et al, 2021).

CSCW focuses on the aspects of sensemaking, common ground, group decision support, etc., and one of the recent directions is a collaborative reflection which has the potential to lead to more superior solutions than individual ones (Prilla et al, 2020) is of interest to this study because LBL represents the outlined phenomenon. Another instance of common ground is the concepts of infrastructuring and crystallization needed for improving communication for large-scale collaboration explored in the example of Bitcoin infrastructuring by Kow & Lustig (2018).

Finally, CSCW research, through the work of Saldivar et al. (2019), acknowledges that blockchain is currently missing from the CSCW research, but it needs to be explored to inform how these technologies can improve democratic experiences. They argue that CSCW can help to understand how situated or shared technologies can support civic collaboration patterns using the example of blockchain for open contracting.

While a diversity of interaction modalities from the formal to the informal are necessary in the support for collaboration, the core of Coordination Theory is that any context beyond the trivial requires core coordination mechanisms formalizing the information, classification, and process of distributed actors negotiating and resolving mutual interdependencies (Schmidt & Simone, 199g). The purpose of these coordination mechanisms is to reduce the complexity in coordination (Carstensen & Sørensen, 1996). While an issue of contention, the implicit assumption is for all participants to be equal under coordination rather than emphasizing the relationships between process and structure (Lyytinen & Ngwenyama, 1992), then the theoretical assumptions behind Coordination Theory resonate well with the Web3 vision of open and egalitarian contribution and collaboration.

Blockchain and blockchain governance

Blockchain is a technology expected to improve current practices from speed to regulatory compliance (Constantinides et al, 2018), leading to increased business value (Lacity, 2018; Lacity et al, 2019). The technology is the subject of significant debate on the future of the web and how the transformation of the current Web2 with dominant global digital platforms, such as Google, Meta, Apple, Tencent and others. The proposed next generation of network interconnectivity based on rights-sensitive digital infrastructures, known as Web3 or Web 3.0, offers a compelling organizing vision (Swanson & Ramiller, 1997) of a future with equal and democratic rights to personal information and digital assets through digital cooperatives — yet this vision still far from realized and also one that can be subjected to critical assessments (Lacity et al, 2019; Voshmgir, 2020; Sunyaev et al, 2021; münecat, 2022). The Web3 organizing vision is at the same time powerful and, despite a growing body of research and practical work, still woefully undefined.

A number of complementary blockchain frameworks have been proposed. Ostern et al. (2020) offer a three-layered affordances model demonstrating what blockchain technology can offer in terms of business actions possibilities shifting from technical features and use cases to the classification of business opportunities provided by blockchain and articulated through the business affordances. Rossi & Sørensen (2019) propose an analytical framework for digital networks in the context of blockchain networks aiming at decentralization, which is discussed in terms of interactional a/symmetries between tokens, network, social community, and consensus protocol. Ziolkowski et al. (2020) apply the lens of six decision problems of blockchain arrangements — the first three problems are known in the IS research (problems of demand management, data management, system architecture design, and development), and the rest contradicts the existing concepts requiring further research (membership, ownership disputes, transaction reversals). Van Pelt et al. (2021) propose a combination between six blockchain governance dimensions (the formation and context, roles, incentives, membership, communication, and decision-making) and three governance layers (the off-chain community, off-chain development, and on-chain protocol layer). Notheisen et al (2017) develop a Blockchain Market Engineering framework, which covers key elements of blockchain economic systems, while the authors call for the extension of this perspective by including all stakeholders for the interdisciplinary analysis and suggest implementing blockchain as an IT artifact linking human and artificial agents on a decentralized level. The role of tokens and their classification is generally not explored (Oliveira et al, 2018; Voshmgir, 2020), though it is an important topic as the tokens can serve several purposes simultaneously, which adds up to the complexity of the designed systems.

Blockchain technology enables new forms of collaboration (Mattke et al, 2019; Sinyaev et al, 2021; Zavolokina et al, 2020; Ziolkowski et al, 2020), but the question of how to manage these systems remains open because the technology and its claims of decentralization are still relatively unexplored (Rossi & Sørensen, 2019). The application of blockchain technology also represents dimensions and layers with varying granularity (Finck, 2018, p. 182; Ostern et al, 2020; Van Pelt et al, 2021) based on the tight couplings of tokens, a network, and a social community, implying complex couplings of cryptographic, computational, economic, legal, and organizational/social dimensions (Rossi & Sørensen, 2019).

However, the technology has been subjected to little research within Information Systems (Notheisen et al, 2017), neglecting its impact on managerial, economic, and organizational aspects (Constantinides et al, 2018) combined with the lack of unified approach and language (Notheisen et al, 2017). Even though blockchain technologies hold promises of enabling novel ways for collaboration, the research is still immature, and there is no explanation on how to design the systems for coordination of work using tokenized blockchain governance mechanisms. The assumption that blockchain systems should be studied as a multidisciplinary phenomenon (Rossi & Sørensen, 2019) motivates the usage of literature from other fields. Coordination theory suits well because of its interdisciplinary nature and usefulness for designing computer-supported cooperative work (CSCW) tools (Malone & Crowston, 1994). The designed IT artifact enables coordination and task allocation for CSCW, while coordination theory allows to decompose the situation of IT artifact application.

Methodology

This study engages participants from London Blockchain Labs[1] (LBL), a non-commercial inter-university organization aimed at community building, education, networking, and employment. LBL is founded and run by students from London-based universities, such as University College London (UCL), The London School of Economics and Political Science (LSE), and Imperial College. This community enables expertise sharing, and activities include community management, events, learning about blockchain and Web3, market analysis, and development of technical solutions. There is a basic hierarchy within the community (roles and teams), although people are not bound to the initial role assigned. People interact freely, and the leadership facilitates interactions and organizes certain activities. Three groups of actors engage through LBL — internal team members, community members, and external stakeholders (speakers, employers, etc.).

Internal team members are the focus of this article, and the first author has been serving as a community member and later as a team leader for almost 2 years providing an in-depth understanding of the mechanics of community functioning and having direct access to the LBL community. They urgently faced a lack of information and tools to monitor internal processes and task allocation during the 2020/2021 pandemic. As a result, the first author decided to investigate the possibility of deploying various coordination mechanisms to alleviate the issue (Carstensen & Sørensen, 1996). These new coordination mechanisms are based on the blockchain, where tokens enable network effects, governance mechanisms, profit-sharing, usage incentives, and upgrading community management practices, e. g., social tokens allowed to tokenize (1) people's services, and (2) value of community reputation (Turley, 2020). Even though understanding of tokens and Decentralized Autonomous Organizations are poor, they are increasingly the subject of debate, experimentation, and deployment (Oliveira et al, 2018; Sunyaev et al, 2021).

The research effort assumed that experimenting with tokenization and coordination mechanisms could offer a new perspective on blockchain systems since it: (1) provides an interdisciplinary set of components to evaluate the situation; and (2) deals with problems related to the subdivision of goals into actions, their assignment, and information sharing (Malone & Crowston, 1990). The theory allows flexibility in the analysis as it can be applied for different coordination goals (Malone & Crowston, 1990) and for organizations with a different decomposition of goals (Olson et al, 2001, p. 18).

The designed prototypes were based on the configuration of standard tools, and of the three iterations engaged, this paper focuses on the third iteration, which accumulated the lessons from the first two. The criterion for evaluation of the designs was in terms of the overall goal of coordination to assess how well the dependencies are managed (Malone & Crowston, 1994) — for the LBL, enabling of collaboration and foster community growth. The prototype discussed in this paper is, in essence, similar to the competitive bidding scheme for computer networks to allocate resources and share tasks (Olson et al, 2001, p. 34) and can be seen as a computational coordination mechanism (Schmidt, 2011, p. 120). Blockchain, in this scenario, provides the underlying layer for coordinating and creating interdependencies between the social community, network, and digital data, documenting commitments (Filippi & Hassan, 2016; Rossi & Sørensen, 2019) — the architecture of the network and tokens may affect the community based on it and vice versa leading to the decisions about the system design and appropriateness of the system overall.

The research engaged internal LBL team members in focus groups and individual interviews for detailed discussions on how a series of proposed prototypes would be suitable to resolve the immediate coordination issue faced. This article uses data from 16 meetings where the proposed prototypes were discussed. A majority of the meetings were individual. There were 13 individual meetings with LBL's CTO, Executive Director, 3 developers, and Head of Events' team combined with 3 group meetings (see Table 1 for a list of

[1] londonblockchainlabs.com

all the interactions). After the individual meetings were over several group meetings with the leadership of the community were carried out to have a group discussion. Each individual meeting was more than one hour, group meetings took around 2 hours. This effort displays similarities to the prototype-based study of the tokenization of administrative documents and processes related to global container traffic carried out by Jensen and colleagues (Jensen, 2017; Jensen et al, 2018), testing a number of different ways of supporting distributed coordination. While the study led by Jensen was situated within a globally distributed context and dealt with the administration of physical objects and certification of their transportation, the LBL case is concerned with a local community of practice (Lave & Wenger, 1991), which at short notice was thrown into being entirely distributed.

The prototype design work and interviews hypothesized that the LBL blockchain enthusiasts would be particularly open to formalize interactions and task assignments through blockchain-enabled coordination mechanisms. As the LBL members are students who actively elected to join this blockchain forum, they have a very positive attitude to the broad Web3 organizing vision, and therefore could also be assumed very positive to early on immersing themselves in technological arrangements based on this vision (Ghobadi & Mathiassen, 2020). The case is, therefore, potentially one of early adoption.

Date		**Meeting type**	**Topic discussed**
29/04/21	I1	Individual meeting with LBL's CTO	Current state of affairs
5/05/21	I2	Individual meeting with LBL's CTO	New solutions for organizing work
6/05/21	I3	Individual meeting with LBL's executive director	Current state of affairs
9/05/21	I4	Individual meeting with a LBL's developer A	Current state of affairs
14/05/21	I5	Individual meeting with LBL's developer B	Current state of affairs
16/05/21	G1	Group meeting with 6 community members	Current state of affairs
13/07/21	I6	Individual meeting with LBL's market analyst	Current state of affairs and new solutions for organizing work
13/07/21	I7	Individual meeting with LBL's developer A	New solutions for organizing work
13/07/21	I8	Individual meeting with LBL's CTO	New solutions for organizing work
15/07/21	I9	Individual meeting with LBL's executive director	New solutions for organizing work
16/07/21	I10	Individual meeting with LBL's executive director	New solutions for organizing work
16/07/21	I11	Individual meeting with LBL's developer B	New solutions for organizing work
16/07/21	I12	Individual meeting with LBL's head of events	Current state of affairs and new solutions for organizing work
17/07/21	I13	Individual meeting with LBL's developer C	Current state of affairs and new solutions for organizing work
18/07/21	G2	Group meeting with LBL's leadership (8 people)	Current state of affairs and new solutions for organizing work
20/07/21	G3	Group meeting with LBL's leadership (9 people)	New solutions for organizing work

Table 1: Outline of the interactions with LBL participants during the three design cycles.

Results

LBL and the Web3 vision

London Blockchain Labs (LBL) participants mostly first encountered Web3 some years prior to joining LBL, mostly through Bitcoin, because of either interest in investment or blockchain coding opportunities. One of the key reasons for people to join LBL is to find like-minded people and share their views on the prospects of the field beyond trading Bitcoin and other cryptocurrencies [I1, I3, I4, I6, I12, I13]. The LBL provides the opportunity to interact with a community of various opinions on a wide variety of protocols, tokens, and projects, as well as with those who build their own projects and do trading: *"...it gives me a bit of a microcosm of like the wider community and how they feel like I certainly feel*" [I7]. LBL provides a place for the interpretation and discussion of the Web3 organizing vision (Swanson & Ramiller, 1997) and allows participants to be part of the movement and improve their insights and skills related to particular aspects of Web3. LBLs Web3 Fundamentals course is, for many, the entry to the blockchain world followed by more in-depth individually guided research reading about and engaging in projects, protocols, and products [I1, I4, I5, I13, G1]. LBL community members indicate that the motivation to join reflects a strong belief in blockchain and Web3 is an enabling factor for the successful implementation of a token-based tool to support remote collaboration [I2, I6, I7, I11, G1]. They argue that people already have a strong interest in blockchain, they came to learn more about it, and the design intervention can be a way to practice the acquired knowledge, which would help to embrace such tool [I2, I3, I6, I7, I11, G1]: *"To learn these tools people need individual motivation — they came to LBL to learn about blockchain, and this could help" [I6].* Throughout the interviews and focus groups, it was frequently mentioned that LBL is a friendly and quite a close-knit community, which is important to consider during the implementation process.

LBL's existing collaboration practices

LBL's collaborative arrangement consists of internal teams, individual community members, and external stakeholders supported by a diversity of digital tools, primarily Slack and Discord channels supported by Google G Suite.[2] Slack provides coordination through specialized channels where communication varies from work-related topics to the sharing of news and in this respect allows for a high degree of individual control in the coordination (Schmidt & Simone, 1996).

The work is characterized by a heterogeneous collection of technical and non-technical projects. Consequently, there is significant variation in how cooperation is orchestrated across projects. Furthermore, work is, specifically during the pandemic, highly dispersed and distributed with varying levels of commitment and engagement coupled with the temporal and spatial distribution of participants. During the pandemic, collaborators were only able to monitor the state of their collaboration (the state of the common field of work) through digital interactions. G Suite tools allow distributed access to coordinating efforts through a shared workspace, which supports mutual adjustment between participants (Mathiassen & Sørensen, 2008), and only to some degree supports a shared awareness of changes. There is no explicit coordination support. This is primarily supported via Slack and Discord, where people communicate and coordinate activities using dedicated channels. Members here direct each other's attention to specific issues through tagging users, reacting with emojis, and through comments. Weekly team meetings and bi-weekly community calls are the primary formalized coordination support.

All the participants note the lack of information despite current practices. The diverse characteristics of projects were raised as one of the reasons for this. Technical projects have their own practices, though developers want to engage more people. The pandemic also affected the integration of newcomers and excluded spontaneous encounters. A lack of information led to a lack of collaboration, with participants arguing that more people would engage if they had the necessary information. Also, there was a need for information about members, such as background, availability, and interests. It was not always clear from the online spaces how and whether people were already committed.

> *"Say what kind of skills they have, and maybe what they need, how much time they have and people who pair up based on that, could be cool. I feel that people have many ideas, but they do not know how to bring them to life."* [Developer B]

The community interactions are carried out in a chaotic manner supplemented by fixed team calls. Technical teams demonstrate this chaotic pulse especially well as intense participation in hackathons is followed by periods of inactivity. Newcomers who arrive during the pandemic lack an understanding of how to get involved despite chats and calls. Nevertheless, the community is driven by interest in blockchain and a desire to get work done. A single source of information and more formalised routines were seen by the participants as the way for the community to function and grow more efficiently. The suggested design was proposed based on this rationale.

The Colony Network — formalization through a DAO

The proposed tool is called The Colony Network[3] (See Figure 1), based on the Ethereum blockchain. According to their whitepaper, "The Colony Network is an Ethereum-based protocol for creating and operating Internet Organizations" (Rea et al, 2020). Internet Organizations' rules are specified in code and

[2] slack.com, discord.com & workspace.google.com

[3] colony.io

implemented by the blockchain mining process. Such automation of business rule enforcement enables new organizational arrangements with direct peer-to-peer accountability (Bøtter & Kolind, 2012) at lower coordination costs than through other means. By reducing the trust needed to coordinate mutual interdependencies and enforcing standards of conduct, it can be feasible to implement market-style interactions (Rea et al, 2020). The protocol is expected to implement economic incentives and decision-making mechanisms for platforms where content or value proposition is generated by the users without top-down decision-making of any kind (Rea et al, 2020). The Colony website, in effect, provides an easily deployable Decentralized Autonomous Organization (DAO) setup with advanced features for management. It is free to use and supports the creation and use of predefined or bespoke tokens. This enabled the tight coupling of mutual interdependencies through tokenization of collaboration.

Through clear descriptions of deliverables, each task needs to be assigned a token value. A computational coordination mechanism (Schmidt & Simone, 1996) predefines the rules in code on a blockchain making both computational coordination mechanism and the articulation of work immutable and transparent as participants' can monitor each other's activities. The governance is implemented through reputation awarded for contributions and consequently used in voting processes, which are usually concerned with conflict resolution mechanisms. The platform supports funds transfers, budget allocation, payments, and revenue management. Authority permissions can be set up and changed by specific users or smart contracts in specific aspects within the organization and for specific teams.

Colony claims to be a flexible and modular tool, and an "Extension Manager" feature allows new functionality to be added to a DAO. Only consensus-relevant parts are on-chain, while the rest such as, for example, communication or other signaling are kept off-chain (Rea et al, 2020). Permissions and some decisions such as the rare need for formally making a motion are on-chain. Reputation is provable on-chain but calculated off-chain (Rea et al, 2020). It can be assumed that tasks are also managed on-chain because they are consensus-relevant. The system is upgraded over time and there is a "gasless" feature which allow to run the DAO without direct Ethereum integration, where validation incurs gas fees.[4]

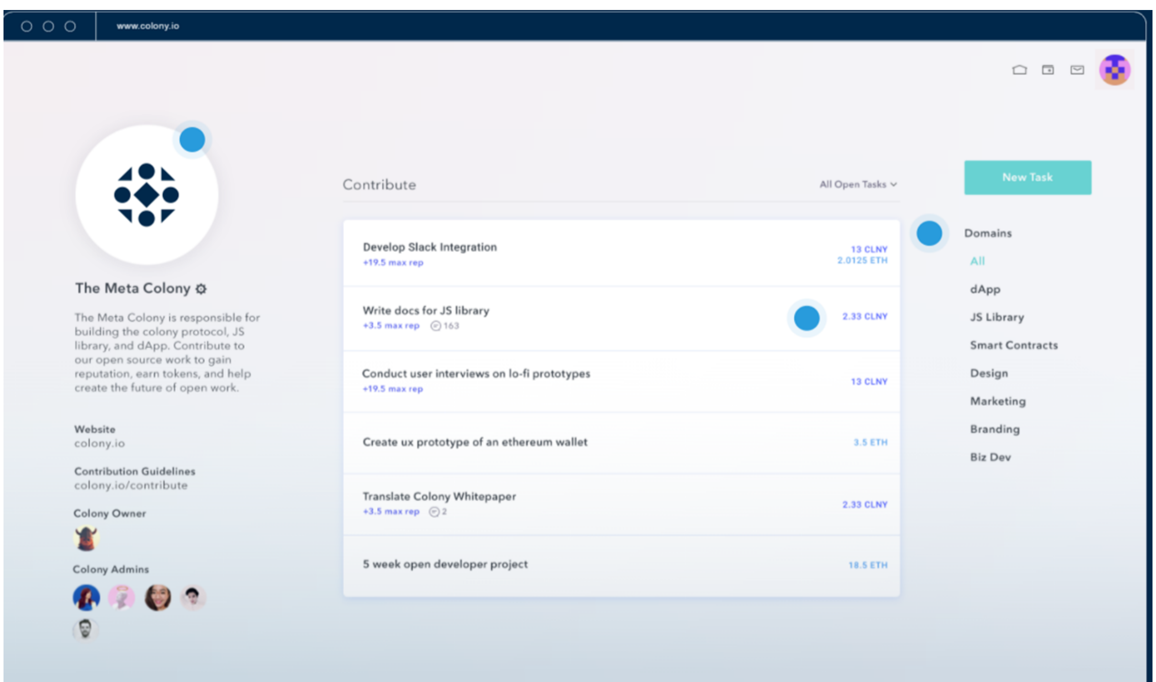

Figure 1: Example screen from the Colony prototype.

[4] ethereum.org/en/developers/docs/gas/

The proposed prototype based on Colony was presented to the community and the following presents the community responses.

Work monitoring

The participants expected the system to be a way of monitoring what is happening within the community and what people are working on, which is especially relevant during the pandemic [I2, I9, I7, I12, I13]: *"If the pandemic goes on for the next several years, this (Colony) would be good to have for figuring out what others are doing"* [I7]. However, important questions were raised related to the kinds and degree of detail of tasks that should and can be tracked [I8, I11, I12, I13]. It was proposed that this should be left to individual teams to decide [I8, I12]. The blurring of task boundaries was raised as a concern — how tasks can be split between people. It was suggested that Colony should only be applied at the project level, while the task distribution is done as usual following more fluid and informal task assignment and interaction [I8, I9, I11, I12]: *"It gets blurrier because, for example, there is a lot of collaboration between the teams which is not planned, people are constantly informing each other, the responsibilities are taken over and then who gets the token?"* [I12]. Interestingly, one of the participants suggested that the more granular and clearer the task is, the better because it would provide more flexibility and clarity about what you sign up for, he also mentioned that in future, as you get to know people better, the work can be taken off the platform and collaboration will be performed in a more informal and partner-like manner: *"Granular is quite good because it gives people more flexibility in terms of you know exactly what you are signing for, what the reward is, all very clear. It is the easiest step to start working with others on such kind of platform and maybe you want to take more as it is a very specified task and then you get to the point where you work with these people on a constant basis"* [I13].

Ecosystem infrastructure

The proposed tool was expected by the participants to become a separate self-sufficient ecosystem [I7, I10, I11, I13, G1], one of the analogies used was the Chinese app, WeChat, where a large range of separate apps and interfaces are replaced with one super-app hosting these as mini-programs under one [I6]. Blockchain functionality and, in particular, the MetaMask[5] wallet, would become a sole identification tool reducing the effort to identify people and replacing traditional Know Your Customer (KYC) processes [G1, I1, I3, I6]. The system is also expected to serve as a reputation tool to track the progress within the community, achieving increased visibility about who is committed and what people previously accomplished as this would facilitate collaboration and hackathon participation [G1, I1, I6, I11, I12]. The system would provide different levels of access to the information and kinds of tasks/projects for the newcomers and core community members [G2, I6, I7, I13]. The management of the system would be assigned only to the LBL management:

"Another question is who has the access to the management of the system — everyone or just the management of the community? This basically questions whether we want a truly decentralized community-driven contributions to the activities or not. Can everyone contribute and access the tool? Of course, I mean that everyone can view but not everyone can edit, this is the question [...] *Access only to few because they know how to use it and it might be unnecessary for everyone. So we need to reflect on the levels of delegation, decentralization and transparency"* [I7].

Learning

The expected learning process of adopting a system based on Colony is a key concern raised by almost everyone [G1, G3, I6, I8, I9, I11, I12]. On the one hand, it was highlighted that everyone should understand how the system and its components work, e.g., MetaMask, governance rules, identification, etc. [G2, I1, I2, I4, I5, I6, I7, I8, I11]. It was also suggested that assigning a key person from each team could ensure buy-in, to help explain the system, and to support its maintenance [G2, I1, I2, I4, I5, I6, I7, I8, I11]. Engaging the LBL leadership was seen as crucial to facilitate the usage of the tool [I1, I2, I8]: *"Leadership involvement is crucial, especially for the early stages, people leading facilitate the usage of tools and collaboration."* [I2]. The learning curve was expected to take some time as using the tool should become a naturally integrated part of project work [I4, I6]. The ability to understand and use the MetaMask wallet was seen as a minimum requirement — especially how the private key is managed [I6, I7]. On the other hand, understanding how to implement the protocol itself will take time to learn and test [I5, I6, I7, I11].

[5] metamask.io

Deployment of the system is not as easy as it is promoted by the service providers, it still needs setting up a DAO, order of operation, governance, etc., which would require active involvement and additional effort by the more tech-savvy people, as not every LBL member is technically inclined [I5, I11]. The challenge of DAO deployment in general and the detailed tokenomics design was raised as challenges. As the system is immutable, rules and possible scenarios will need to be defined up front, but at the same time, the complexity requires some degree of experimentation (Mathiassen & Stage, 1992) [I5, I6, I7, I11]: *"These protocols are also about the learning curve. To understand how to do it, need testing to see how it works and whether it is necessary" [I7].*

One of the key-aspects identified here, is that of the on-chain/off-chain design. Although such a system is expected to have a higher level of trust through the transparency ensured by the code on mainnet [I6, I11], in practice, the implementation on-chain was seen as rather limited. All the tasks would be kept off-chain, while only key governance rules and questions would be kept on-chain because of the associated costs [I1, I6, I11, G3]. It was even suggested that nothing should be kept on-chain [I11, G3]: *"Nothing would be on-chain, it is too expensive" [I11].*

Trust

The issue of on-chain/off-chain design leads to a discussion of trust in terms of the degree of formalization leading to less need to trust, but also that trusting relations may not require significant formalization of the mutual interdependencies in collaboration. Participants argued that LBL has a sufficient inter-personal trust to have a semi-formal organization where only key elements are formalized, as opposed to the "trustless" communities where inter-personal trust is sought replaced with engineering [I7, I8, I11]: *"Our community has enough trust to have a semi-formal organization. In trustless ones — it is replaced with engineering. We have enough trust, so only core elements should be formalized" [I11].* It was argued that this kind of system is too complicated and unnecessary because the community is a trusting one [I7, I8, I11, I13, G3]. It is, furthermore, argued that collaborative activities are not as easily verifiable as payments — work still needs people to verify their completion and this to some extent defies the purpose of deploying smart contracts as it then is not fully decentralized [I2, I6]:

"When you are working with strangers, you still have to trust. With the bounties boards there is always an element of trust, isn't it? I don't know if there is a way to make it fully trustless. I guess you would expect everyone within the group to have good faith. For LBL it is unnecessary as we have a very friendly community." [I13]

Paradoxically, trust in blockchain-enabled systems is ensured by the code, which, on the one hand, cannot ensure proper work evaluation as it turned out in the deeper discussion (initially this system was seen as a great solution), on the other hand, it is too expensive to run code all on-chain [I6], which is the most immutable and trustworthy architecture to fulfil blockchain promises of full transparency and accountability: *"People trust to code if it is on the mainnet because it cannot be changed and fork is not possible. It gives everyone higher transparency" [I6].*

The point was also raised that within the Web3 community there seem to be two camps where one camp strongly believes in full collaboration, and another in adversarial interaction [I2], which are imaginaries held by the different individuals on the future of infrastructure (Kow & Lustig, 2018). The preference to one of the directions would depend on the purpose and context of the community. Decentralized Finance (DeFi) projects where money is what people offer to each other could, for example, be expected to more easily lead to adversarial interactions. It was concluded that it depends primarily on the nature of activities and the views of those who lead [I2].

Token role

Collaboration tokens would have value both when they would symbolically signify participation in LBL activities — as an axial currency (Pitt et al, 2018) — and as a means to get paid for contributions without other significant LBL interest and engagement [I1, I6]. As soon as the incentivization through tokens is in place, it may be seen as a different kind of interaction and relationship, the community role is not necessarily seen as important [I7, I12, I13]. *"Incentivization and rewards are important factors that could improve engagement but also probably would not need to know people that well if it is just about getting paid. Though the possibility of fraud is higher too"* [I13]. Monetary rewards through tokens may actually lead to a shift from collaboration to adversarial, non-collaborative, interactions [I2]: *"If people are paid,* *this is a different way of interaction and communication. And relationship as well, doesn't need to be such a close-knit community." [I12]*

A necessity for the system

Despite all the enthusiasm and support for such a potentially convenient blockchain-enabled transparent system based on codification and tokenization of trust and the resolution of mutual interdependencies, it was concluded that for LBL, such a system is unnecessary primarily because of the nature of the community — it is already trusting enough, relatively small and the proposed system is too complex [I4, I7, I13, I12, I6, I1, I2, I8]: *"This would require additional effort to evaluate the outcome of the task. For LBL it is too much and too rigorous, for the bigger organization this would be useful, for example, if we grow to the level of the ecosystem with several communities united through our protocol"* [I6].

Complexity was reflected in several senses: 1) deployment and further maintenance, 2) high level of rigour and unclarity about how to define tasks (fine-tuning of the level of detail and fluidity of responsibility boundaries), 3) work results evaluation (need for human intervention), and in general, 4) the system's technical complexity would require a substantial learning to reach the necessary ease of use. It was suggested that this tool could be used for inter-organizational interaction and in larger organizations [I6, I7, I11, I13] where there is less trust and people can be assigned to manage the tool [I11]:

"And the thing is that I guess you have to balance the degree of decentralisation to, you know, the ease of use. And so some aspects might be just a lot easier to centralise and to have that ease of use than to make everything decentralised" [I4].

"This would require additional effort to evaluate the outcome of the task. For LBL it is too much and too rigorous, for the bigger organization this would be useful, for example, if we grow to the level of the ecosystem with several communities united through our protocol" [I6].

Discussion

The main goal of this paper is to investigate the need for formalization of coordination in a distributed community when collaboration went exclusively online because of the global pandemic 2019-2022. As the complexity of coordinating distributed work grew, the need for the adoption of coordination systems urged dramatically as well (Winograd, 1994; Carstensen & Sørensen, 1996). The pandemic shifted coordination completely online, and the number of participants with various competencies increased adding to the complexity. The participants expressed the need for information and more formalized routines to organize coordination. We will in the following discuss the findings in terms of: 1) the community readiness for distributed collaboration; 2) the temporal lag in the adoption of various technologies characterized by network externalities; 3) discussing the inherent challenges of formalizing coordination; and 4) assessing blockchain as a suitable technology to support the coordination of distributed work.

Coordination readiness

As a community, the London Blockchain Labs (LBL) potentially represents a fertile ground for the adoption of computational coordination mechanisms. The community is significantly invested in the technological developments associated with blockchain technology — it can be assumed to have signed fully up to the Web3 organizing vision — a highly positive attitude to the application of this type of technology, similar to the developers' attitudes to social networks investigated by Ghobadi & Mathiassen (2020). It is also supported by the ongoing infrastructuring as various people with different goals and motivation are involved to infrastructure to deliver value to a social group (Know & Lustig, 2018), in this case LBL. Besides, LBL as an online community provides a platform for people for collaborative reflection where they can share and articulate experiences looking for solutions (Prilla et al, 2020) for both LBL-specific issues and a wider range of individual Web3-related problems

We will also implicitly assume that the community members are relatively well-prepared and ready for mediated collaboration as they would have a high degree of common ground, collaborative readiness, and collaboration technology readiness — even if projects would potentially consist of tightly coupled activities (Olson & Olson, 2000). Despite various backgrounds and cultures, LBL members can be characterized as relatively homogeneous. They are all young and mainly recruited from London colleges and unified by a keen interest in blockchain technology. People use imaginaries, which improve their understanding of the common vision, motivations, and common ground through using abstract forms which tend to be less technical (Kow & Lustig, 2018).

LBL activities contain both loosely and tightly coupled work. The extreme example of tightly coupled work is participation in hackathons — the system design stage requires intensive collaboration. Some of the activities are straightforward and do not involve many dependencies; the problems arise at the project level, where the number of people and dependencies increase.

LBL members are keen to collaborate primarily based on their enthusiasm and interest in blockchain as was highlighted by the participants and a core reason for the LBL's existence. People collaborate and get things done, even, as highlighted by community feedback, better incentives would support collaboration further, as also argued by Olson & Olson (2000).

While it could be assumed that this particular community would be highly technologically ready to collaborate, this turned out a rather more complex issue. Despite the initial readiness for the proposed technological support, significant concerns were raised regarding the application of blockchain technology. The application of blockchain tokenization of commitments represents the highest measure of formalization as it provides full transparency, accountability, and codification of commitments, reflecting the common mantra from the blockchain community desiring "code to be law" (Filippi & Hassan, 2016).

Lag in Adoption of Network Externality Technologies

When various CSCW tools and services became the subject of discussion and adoption during the late 1980s and early 1990s, the immediate lack of success in this particular form of formalization in the coordination of distributed work activities could be explained by a number of factors, such as; aligning the benefit with the effort required, a lack of supporting management practices and systems, and the difficulty of evaluating the systems before taking them into full use since the benefit is from the network effect of widespread adoption (Grudin, 1989). However, as the technology matured many of the initial issues were overcome as organizations saw the clear benefits of adopting these systems to support the negotiation of mutual interdependencies in distributed and even co-located teams precisely because these systems are not governed by individual users' discretion, rather the network effect can create collective pressure to adopt once a critical mass of adopters has been reached (Grudin & Palen, 1995). The global pandemic hit all organizations in early 2020 created an unavoidable impetus for the wholesale adoption of collaborative tools. This resulted in the adoption of a range of new tools, mainly for video conferencing, instant messaging, scheduling, project management, and remote surveillance (Lund et al, 2020; Economist, 2022).

As all coordination technologies inherently will be governed by some form of network effect as a critical mass is needed, and once surpassed, likely will lead to wider adoption, we will also expect any blockchain technology aimed at supporting distributed collaboration to be subjected to the same issues as groupware technologies for distributed scheduling. However, moving from small teams within and organisation to small teams between organizations potentially create the need for further formalisation and incentivising contributions through transparency and tokenization. While the early adoption of groupware systems primarily supported teams engaged in distributed collaboration within a given organization, the primary use-case for the application of blockchain technology to support collaboration would likely be in loosely coupled collectives of individuals or in the inter-organizational collaboration engaging multiple organizations (Lacity et al, 2019; Lacity, 2020). We would here assume further complexities in the adoption as consortia agreements on governance and design when engaging participants with potentially diverging interests.

Challenges of formalization

While the application of blockchain technology in some contexts will mark a significant formalization where it is highly appropriate and restricting, as indicated in the feedback from the LBL members, it may indeed, as with the great variety of groupware technologies supporting collaboration, be a problematic addition in other collaborative arrangements. In our design interventions, it turned out that even a blockchain-embracing community such as LBL is not yet ready to implement blockchain (Olson & Olson, 2000).

The debate during the 1990s on the formalization of distributed coordination arrangements, and the associated consequences, illustrates well both the organizational challenges of increased formalization and codification of coordination work, as well as how easily the academic debate on the issue can become polarized.[6] The concern is less about the need for some form of formalization but rather formalization of what, for whom, and to what extent individuals are directly able to malleably adjust the arrangements to own needs. In this respect, the need for some form of codification of the arrangements is contingent upon the complexity of the collective endeavour envisioned and the extent to which this complexity can be managed by combinations of modularity and technology (Winograd, 1994; Carstensen & Sørensen, 1996). Producing reliable and useful classifications of the work to be done is, on its own, a challenge if it is not approached as a collective process establishing shared insights (Cook & Brown, 1999; Sørensen & Snis, 2001).

Paradoxically, the blurred boundaries between projects and interests of participants combined with constant shifting plans hinder the formal definition of tasks yet call for some formalization as the complexity of coordination dramatically increased because of the pandemic. The teams seem to have constructed formalization out of the informal by orchestrating coordination in Slack and Discord channels, where standardized structures with shared meaning, in effect turns into unstructured declarations of commitment.

Blockchain for coordination

Why can blockchain be considered as a suitable technology for collaboration, and what roles could it play? Firstly, it can play a small part of the middle management role of assigning and allocating work — similarly to the centralized algorithmic management used on multi-sided platforms, such as Uber and Lyft (Möhlmann & Henfridsson, 2019). Here, the matchmaking work of coordinating transportation and assessment of the two side's performance is largely replacing humans (Lee et al, 2015). In the LBL case, a blockchain would manage multi-party relationships amongst a group of equals with flexible task allocation and, in advance, stipulate all necessary details on deliverables and rewards.

Supporting the coordination of distributed interdependencies through any kind of computational mechanism requires the formal codification of certain aspects of the coordination, such as protocols orchestrating the unfolding of events and various classification schemes formalizing the various objects and actors engaging in distributed coordination activities (Schmidt & Simone, 1996). Blockchain technology supports additional layers of transparency and accountability by producing an immutable record of contributions and by providing a consensus scheme allocating rewards according to contributions. The application of blockchain technology for distributed coordination can also be seen as a reputation system for internal and external job markets. The Colony prototype could, for example, support the need for knowledge workers in Robertson et al. (2001) to document how they contributed to a variety of projects they engaged in and where an artificial currency system of project impact already existed.

Tokenizing engagement outcome in such a system is not just a reward and incentivization mechanism it also contains reputational, relational, and institutional information (Pitt et al, 2018). More importantly, it would also represent collective values of belonging to the community (Pitt et al, 2018). Tokens represent an additional dimension by which to consider the management of multi-party relationships, tracing and encoding activities in a more formal manner, and based on transparency and equality amongst all members (Rossi & Sørensen, 2019). Blockchain for the coordination of distributed activities provides a transparent and codified common ground for commitment. As LBL became a fully virtual community in 2020 operating based on solely computer-based networks, codification of the world they inhabit became inevitable (Sørensen & Snis, 2001) — the LBL community was ready to go one step further from codification of just general principles or categories to the codification of commitment via blockchain.

Blockchain technologies provide a paradoxical answer, in that the technology engenders the need for community and collective activities based on a shared understanding of what is to be formalized, yet simultaneously also provides an inherent need to up-front establish an autarkic arrangement whereby the rules of the game are agreed on *a priori*. The notion of blockchain transparency and immutability is exactly premised by collective up-front agreements through encasing the collaborative "law" into "code" — here, the mechanisms not only stipulate the coordination of activities but also the tokens signifying traceability of and rewards for contributions. Perhaps it was precisely the in-depth understanding of not only potential

[6] The Volume 2 and 3 special issues of the CSCW journal debating Suchman's (1994) initial propositions provides a rich debate covering contemporary influential commentators across 15 papers.

blockchain advantages but equally the inherent up-front requirements for initial formalization, which made the LBL members push back against the use of a technology they are united in support of.

Yet another paradox that seems to be hidden within the LBL experiment is the inherent Web3 assumptions of equality and the hierarchical LBL organization with formal role assignments. This led to discussions of systems of authority and access. It is likely a pragmatic necessity to ensure the commitment and participation of those donating their time and efforts on a voluntary basis by assigning formal positions of authority through role definitions. This also supports the fluid continuity as LBL volunteers come and go. However, the strength of the Web3 organizing vision, and indeed the foundational basic assumptions of blockchain technology is a strong sense of the equality of all full participants, network nodes, and tokens (Rossi & Sørensen, 2019). Each crypto-token is equal to any other, each full node is equal to all other full nodes, and each member of the social community is equal to all other members. However, as the pragmatic reality is far from this vision, so is the practical reality of the organization of efforts at LBL. Some bitcoin (BTC) are newly minted by the consensus algorithm, others have been part of shady activities, some nodes are part of powerful mining pools, others are merely running on a bedroom computer, and most importantly, some members of the Bitcoin social community are "whales" with large holdings able to greatly influence the market, others have only very small amounts. Similarly, the organizing vision of equality amongst all open source project contributors and the theoretical possibility to fork projects does not match the reality where very few developers have oversized influence in coordinating efforts, and the stigma of behaving anti-socially by forking projects without explicit permission from the owners (Raymond, 2001).

The challenges faced raise the issue of the differences in formalizing the data necessary to engage in distributed collaboration, and of formalizing the process of engaging this data. In cases of high coordination complexity, such as ensuring that all students and lecturers know what course to teach, where and when across a university, will be forced into a streamlined coordination mechanism — the timetable all must follow. However, this is at a high level of granularity, while much more detailed encasing of law into code represents increasing difficulty — such as stipulating how each lecture must be structured. As argued by the LBL participants, while it may be feasible to formalize incentives and rewards at the level of projects, teamwork at a more granular level relies significantly on more fluid and informal interaction. Coordination among technical experts requires a balanced formal and informal means of communication, even when collocated (Kraut & Streeter, 1995).

However, in the context of tokenizing incentives to engage in distributing rewards, the associated problem is one of the inseparability of the static aspect of a token, and the dynamic aspect of allocating it, i.e., the consensus algorithm defining equality of all members' rewards given the same input. While other contexts allow for the separation of the underlying data needed to coordinate distributed activities and the unfolding of the collaborative process, this is not straightforward for blockchain arrangements seeking to tokenize rewards.

Team-based trust is critical to establishing effective collaboration both within teams where conflicting goals may emerge or in inter-organizational arrangements (Malone & Crowston, 1994; Zavolokina et al, 2020). Trust is a shared disposition for interaction between people sharing motivation and the ability to make similar sense of a situation following the same sense-making methods (Lee et al, 2021). While the design discussions at the LBL emphasized the need to incentivize collaboration and engagement through granular trust-enhancing mechanisms, providing incentives through tokens was not seen to resolve this issue of enhancing the granularity of trust in collaboration. The issue of trust is paradoxical as blockchain technology often is labelled as trustless or trust-enhancing, while the participants stressed the need to know the person they deal with to successfully complete a task. Lee et al. (2015) argue, similarly, that drivers trusted their experiences rather than algorithms, though, in contrast, transparency in algorithmic calculations was seen as a possible solution to improve drivers' trust in the algorithms. While blockchain technology does not necessarily resolve the trust problem in distributed collaboration, the co-located team can generate trust within the team through close collaboration, remote team collaboration can, in turn, instead be based on pre-perceived trustworthiness, which may indeed be independent of actual performance (Zolin et al, 2004).

Conclusion

This paper explored how coordinative practices can be formalized to improve collaboration during the pandemic within the context of the London Blockchain Labs (LBL) where participants provided interview-based and focus group feedback on design suggestions to investigate the use of blockchain technology to support the distributed coordination of small team virtual project working. The LBL blockchain enthusiasts identified the significant and urgent need to further formalize coordination processes as well as to incentivize and reward efforts transparently. However, the hypothesis that this constituted an ideal use-case for the tokenization of coordination processes resulted in a more nuanced and complex set of results. This formalization of translating the laws of team coordination into code (De Filippi & Hassan, 2016) turned out impossible mainly because of the inability to predefine all the interactions, set boundaries in tasks, and responsibilities within a context already characterized by sufficient trust among the participants. For this kind of online community, a semi-formal system is seen as the most viable option because coordination is based mostly on informal practices, tacit knowledge, and personal relationship where the most viable coordination tools in effect are shared workspaces rather than a formal stipulation of the coordination process. While blockchain technologies and the Web3 organizing vision may hold great promise of supporting globally distributed teams and individuals engaging in seamless self-organization of distributed activities without a strict coordinating leader function, it is also evident that this particular type of technology represents the old problem of formalizing collaborative processes in a new form. As distance still matters, so does it how and when collaboration is sought tokenized.

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